Q&A: Researcher investigates how panda cubs communicate with their mother

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A mother panda holds on to her newborn cub. Credit: Guiquan Zhang

Earlier this summer a giant panda named Ai Bao delivered twin cubs in a South Korean zoo. Although pandas often give birth to twins, typically only one cub survives, especially in the wild.

And to survive, this tiny helpless cub needs to communicate with its

mother—better and more urgently than the twin.

Dr. Christina Buesching, an Adjunct Professor with UBC Okanagan's Irving K. Barber Faculty of Science, is a researcher who studies how animals communicate with each other. In collaboration with a group of Chinese co-authors, she recently published a study examining the way newborn panda cubs acoustically connect with their mother.

Blind at birth and just one-900th of the size of their mother, the two babies compete for nourishment and care by making sounds. Those squawks, squalls and croaks likely determine whether they'll survive or not.

What is the survival rate for pandas born in the wild? And in captivity?

Approximately 56 percent of giant panda births are twins. However, even though the new mother will spend two weeks fasting and doing nothing but caring for the babies, if raised in the wild, typically one of those cubs will die shortly after birth.

And in captivity, the mortality of pandas younger than one month—especially during their first 15 days—is 22 percent higher than in any other age class.

To avoid this high neonatal mortality and ensure the continued survival of this charismatic species, twins born in captivity are switched regularly every 24 hours, so the mother only ever has to care for one baby while its twin is being nurtured by the zoo keepers.

Interestingly, we currently don't really understand how the mother decides which cub she will favor. Because the cubs are so tiny and

helpless, the only way they can elicit maternal attention is by making sounds—and it's those sounds that likely determine which twin survives.

In essence, they need to communicate to their mother "Feed me, not the other one." Therefore, we propose in a recent publication in *Integrative Zoology*, that poor understanding of early-age vocal mother–infant communication may be a reason for the high mortality rate of newborn pandas.

So what kind of vocalizations do newborn panda cubs make?

Panda cubs use three distinct calls: harsh-sounding squawks, high-pitched squalls and throaty croaks. These are so-called broadband calls and comprise a very wide frequency range, as well as contain both audible and ultrasound components higher than 20 kilohertz.

Of course, these sounds should have evolved to elicit maximum maternal care and attention, but in the wild the cubs are potential prey to other animals including golden cats, yellow-throated martens and even the Asian black bear. Ideally, their calls should therefore be something just the mother can hear.

Can you explain why baby pandas use both ultrasound and lower frequencies?

Our analyses show that the calls get deeper the older and bigger the cubs get.

This is quite interesting in the context of "survival of the fittest" because the lower call frequencies require longer vocal cords. Therefore, deeper calls could be an unmistakable way for a baby panda to signal to its mother that it is big and strong and growing rapidly—in fact much

bigger and growing faster than its twin—and therefore worthier of the mother's attention and care.

Ultrasound, however, is much harder to pinpoint and therefore cubs vocalizing in higher frequencies may be harder to detect by predators. So, cubs may be safer when calling in ultrasound, but they may get more attention from their mother than their sibling when calling with a deeper voice.

This truly is a biological example of being stuck between a rock and a hard place.

Broadband calls have been reported in several other species, which would typically use ultrasound calls when babies are distressed or desperate to get their mother's attention. But before our study, they had not been reported in mother–infant communication of any large solitary terrestrial carnivore.

How did you conduct this research?

We analyzed 5,300 calls including 3,475 squawks, 1,300 squalls and 490 croaks of 11 panda cubs under 15 days old—seven males and four females.

When a cub was removed from its mother for scheduled health checks, we played back a recording to gauge her interest in the sounds. But to investigate the biological significance of the different frequency ranges, we modified these recordings using computer software so we could delete either all ultrasound components and playback only the deeper frequencies, or do the opposite and remove all deeper frequencies playing back only the ultrasound components.

We also played the natural broadband calls, which included the complete

frequency range.

Our observations showed clearly that females could hear frequencies of up to 65kHz, and eight of the nine mothers reacted strongly to ultrasound playback by searching for the source of the calls—in this case the speakers. But all nine females responded much stronger to broadband calls and calls comprising only the deeper frequencies by being alert and investigating the speakers.

This leads us to conclude that cubs uttering deeper calls do have an advantage in competing for maternal care and attention.

Why is it important that we know how pandas communicate?

The giant panda is a true flagship species for conservation and often serves as China's national symbol. It was endangered for many years, but due to considerable and far-reaching conservation measures in the wild, and a stringently regulated captive breeding program coordinated between zoos worldwide, panda numbers are recovering.

In 2016, the International Union for the Conservation of Nature's Red List downgraded their conservation from endangered to vulnerable and in July 2021, China followed suit. However, the mortality rate of panda cubs is still high.

This research suggests that better understanding of early-age vocal mother–infant communication may help increase cub survival.

Understanding the detailed ins-and-outs of a species' behavioral and physiological needs, however, is crucial in designing effective habitat conservation and management strategies. In a paper, published in *The*

Innovation, we examined the pros and cons of creating single large protected areas as national parks or conservation areas to investigate the benefits of protecting several smaller areas to encompass a higher number of panda subpopulations

More information: Lin Zhao et al, Giant panda (Ailuropoda melanoleuca) neonates use broadband calls to communicate with their mothers, *Integrative Zoology* (2023). DOI: 10.1111/1749-4877.12722

Biao Yang et al, Need of a paradigm shift to conserve endangered species in China's national park system, *The Innovation* (2023). DOI: 10.1016/j.xinn.2023.100462

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